COMSTEEL

COMMONWEALTH STEEL COMPANY LIMITED
STEEL MANUFACTURERS, WARATAH, N.S.W.

COMMONWEALTH STEEL COMPANY LIMITED

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Plant, Processes and Products at Waratah, N.S.W.

Together with a Brief History of the Company since 1918

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Head Office and Works:
WARATAH, NEW SOUTH WALES

Branch Warehouses:
SYDNEY, MELBOURNE, BRISBANE,
ADELAIDE, PERTH.

INTRODUCTORY NOTE . . .

Toward the end of World War I, a company was formed to manufacture railway wheels, tyres and axles, and steel castings, at Waratah, N.S.W.

Twenty years later, with World War II looming, Commonwealth Steel Company Limited had become a vital link in the chain of Empire defence then being planned at Whitehall.

By 1942, it was one of Australia's essential war industries, the sole source in this country of the special steels without which our war effort would have been seriously handicapped—if not crippled entirely.

To-day, the Company ranks as one of Australia's major steel works; its products are as varied as the whole pattern of Australian industry; and it is playing as important a part in reconstruction as it did in war.

This booklet briefly outlines the Company's development, its equipment and capacity, and will, we believe, be of interest to every visitor to our Works.

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GENERAL LIST OF PRODUCTS MANUFACTURED

High Speed Steels.
Special Alloy Tool and Die Steels.
Aircraft Steels.
Carbon and Alloy Constructional Steels.
Hollow and Solid Mining Drill Steel.
Stainless and Heat Resisting Steel Sheets and Bars, Forgings and Castings.
Forgings and Castings in Carbon and Alloy Steel.
Nitralloy Steel and Case Hardening Steels.
Assembled Railway, Tramway and Skip Wheel Sets.
Locomotive, Carriage, Tramway and Wagon Wheels, Tyres and Axles.
Manganese Steel Points and Crossings for Tramway and Railway Trackwork.
All types of Forgings and Castings for Shipbuilding.
Forged Steel Grinding Balls and Cylpebs.
Dredging and Mining Equipment.
Selling Agents for "Bromet" Tungsten Carbide Tools and Tips.

THE COMPANY TO-DAY . . .

The growth of this Company is not to be measured solely in terms of plant and buildings, although the statistics are impressive.

It has become, through its increasing range of products and the diversity of their uses, a vital factor in the everyday life of the entire community.

On the railway and tramway wheels, tyres and axles produced at these works, hundreds of thousands of Australians ride each day to and from work, or travel on holidays or business, safely and surely.

COMSTEEL tool, die, and alloy constructional steels are used to equip and maintain the factories on which the community depends for its necessities, its luxuries, its employment. They build and maintain ships and buses, shearing sheds and aircraft, butter factories and radio stations, and many more of the essentials of Australia's industrial economy.

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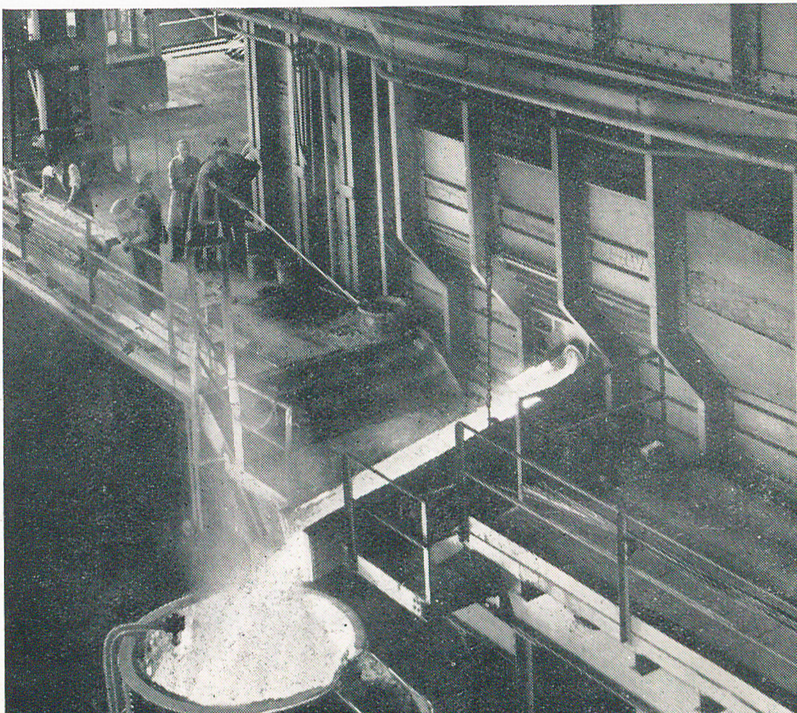
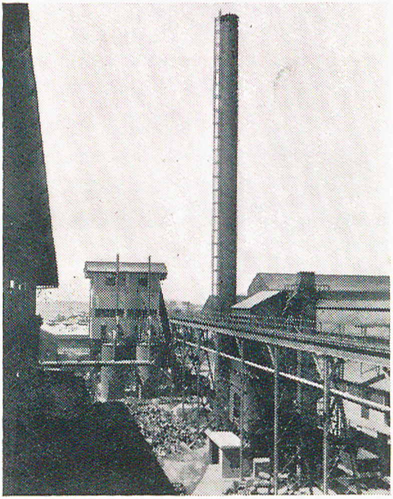
• BELOW: *Tapping molten steel from the 50-ton Open Hearth Furnace.*





• LEFT: *Gas Producer Plant, supplying the Open Hearth steel-making furnace.*

Foods, cosmetics, beverages, textiles — all these and many more products of Australian factories are at some stage processed in equipment fabricated from Comsteel Stainless Steel. It is in the office building, the theatre, the restaurant, the butcher's shop, the hotel, the railway car; it is decorative, practical, versatile — and its uses are almost without end.

Over 140 different grades of steel were being produced at these Works at the height of production for war, and to-day even when many special grades are no longer required, the list comprises more than 160 grades.

Steel making equipment comprises the following principal units :—

OPEN HEARTH : A 50-ton capacity regenerative Open Hearth Furnace; mechanical gas producer plant; annealing furnaces; stockyard, teeming pits, charger and cranes. This furnace is capable of producing either alloy or plain carbon steels.

ELECTRIC STEEL PLANT: Three Heroult type arc furnaces, basic lined, capacities 1½ tons, 8 tons and 10 tons respectively; one 5-cwt and one 1-ton High Frequency Furnaces.

THE SPECIAL STEELS PLANT INCLUDES: 30in. Bloom Mill, 12in. Merchant Mill, and the necessary heating furnaces; grinding, straightening, and heat-treatment equipment for processing bars after rolling, and ancillary equipment.

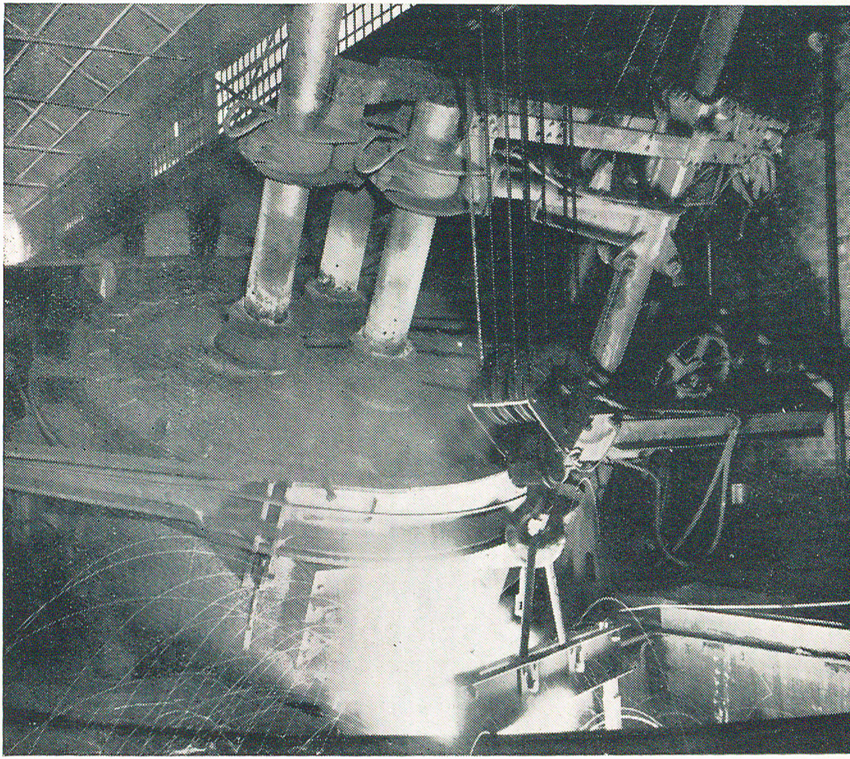
THE SHEET MILL is equipped with two rolling mills and heating furnaces, heat-treatment and descaling plant.

THE SHEET WAREHOUSE, where Stainless Steel Sheets are given their final processing, is equipped with straightening, shearing, grinding and polishing plant capable of producing sheets to the highest standards.

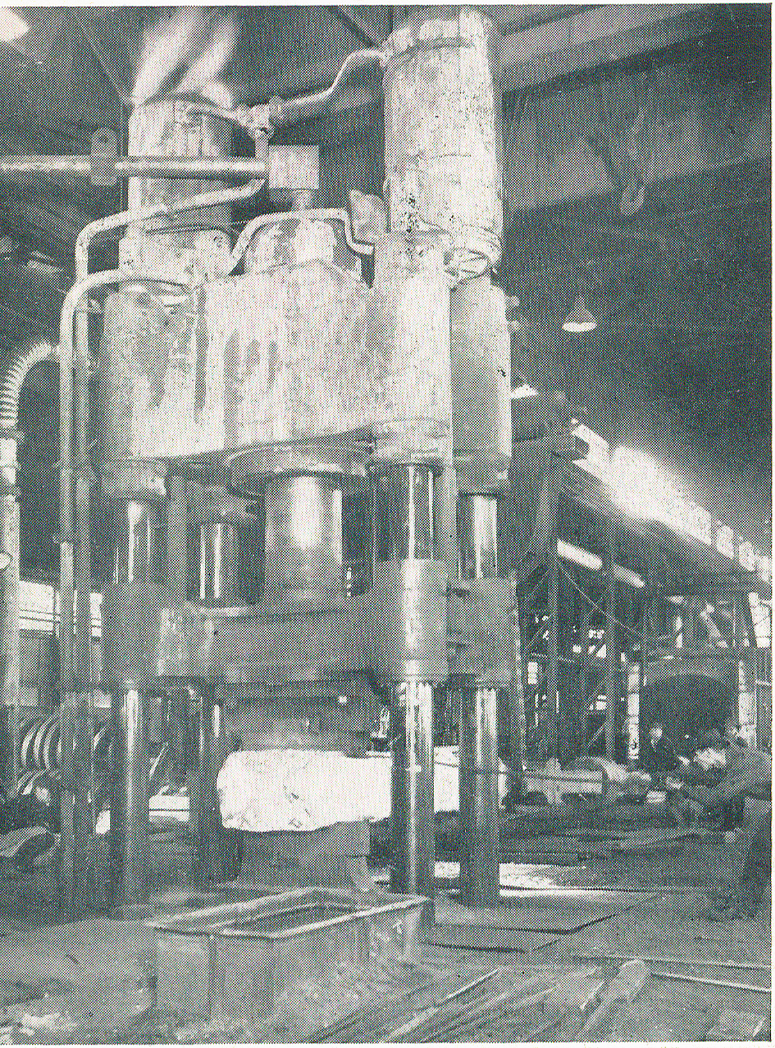
TOOL STEEL FORGE PLANT, where high speed steels and other special tool steels are processed prior to rolling, comprises grinding, inspection, heating and forging equipment, including a special magnetic crack detector to ensure sound steel.

STEEL FOUNDRY: Extending from the Electric Steel-making Department, this section of the plant has modern sand-treating, machine moulding and core making equipment, sand and shot blast plant, and grinding and dressing sections for the final treatment of castings. Castings are produced in carbon, alloy, manganese, stainless and heat-resisting steels.

• BELOW : *Tapping Stainless Steel from a 10-ton Electric Arc Furnace.*



• BELOW :– *A stage in the manufacture of a large forging on the 1200-ton Forging Press. Heavy marine forgings, hollow forgings, turbine forgings and the like, each many tons in weight, are produced on this unit.*



WHEEL, TYRE AND AXLE PLANTS: Railway or tramway wheels may be of various types. There is the composite wheel with a cast steel spoked centre and rolled tyre; the composite wheel with a cast or rolled disc centre and rolled tyre; or the one-piece solid rolled wheel, in which hub, plate and tyre are one unit, rolled from one piece of steel.

Solid wheels, tyres, rolled wheel centres, smoke box rings, gear rings, and other circular products are rolled from forged blanks on an electrically driven, hydraulically controlled tyre mill. This mill forms tread, flange, lip and all other surfaces simultaneously, as well as expanding the forging to the required diameter.

Preliminary forging is carried out on a 2000-ton steam-hydraulic press.

Axles are forged under a 5-ton hammer and machined in a specially equipped department. Tyres and wheels are machined in a separate bay.

ASSEMBLY SHOP: Those wheel centres, tyres, solid wheels and axles which are required to be assembled as wheel pairs mounted on axles are sent to a centrally located Assembly Shop, equipped with a wheel press, shrinking-on plant, wheel lathes and balancing equipment.

HEAT TREATMENT: This important process is provided for by a number of heat-treatment units situated throughout the plant, as well as in a special department equipped with the most modern facilities for temperature and atmosphere control and for the heating and quenching of large forgings or castings.

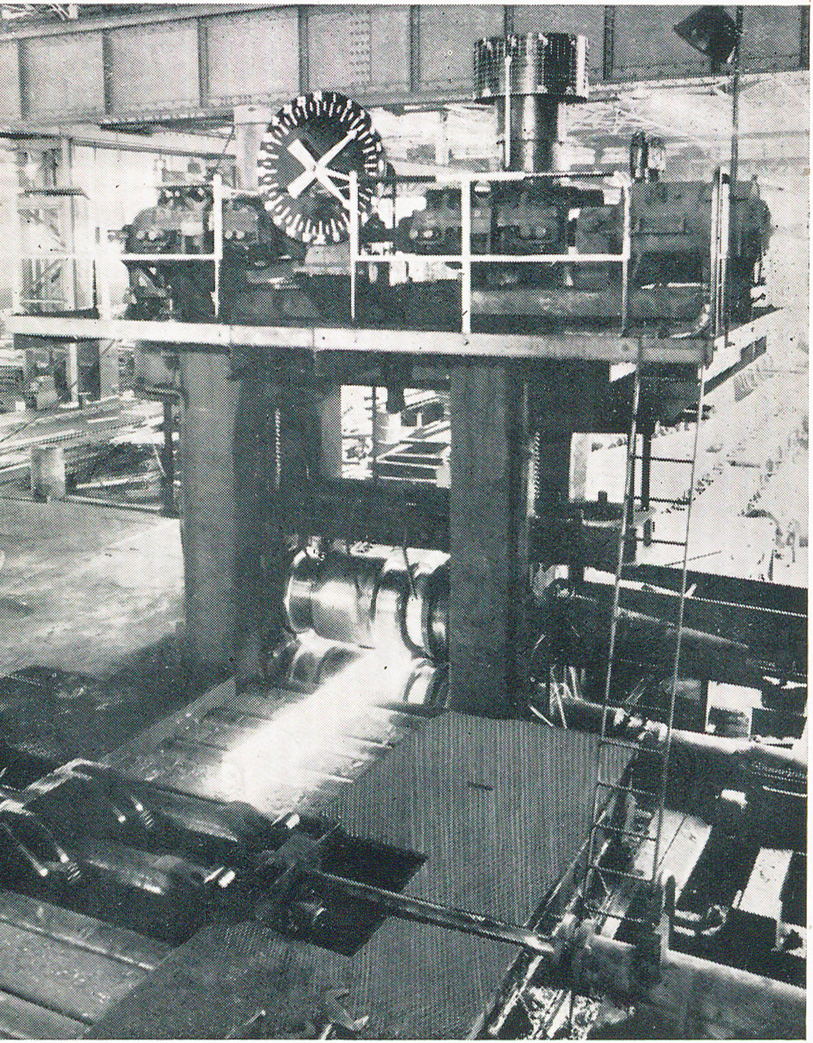
FORGINGS: Large forgings, up to many tons in weight, are produced under a 1200-ton forging press; these range from ships shafts to diesel engine crankshafts; hollow pressure vessels, gun barrels and so on. Forgings which require machining are handled in a heavy machine bay adjacent to the forge plant.

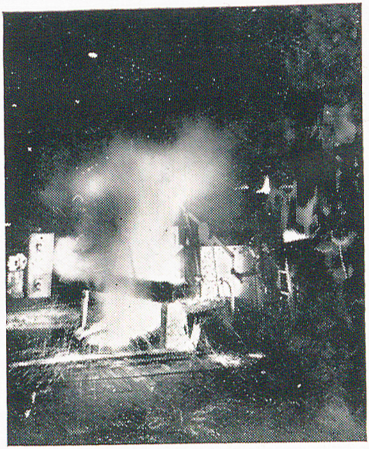
There are also several other forging units for the production of die blocks and general forged work.

FORGED STEEL BALLS: For use in grinding ore, cement, and similar materials in ball mills, these are made of a special wear-resistant steel, forged under a press and special hammers in a department of the Forge Plant. These balls are shipped to many parts of the world.

EXTENT OF PLANT, BRANCH WAREHOUSES, ETC.: The Company's Works at Waratah are situated on a property of 50 acres of which more than 10 acres are under roofs. There are Branch Warehouses in Sydney, Melbourne, Brisbane, Adelaide and Perth, as well as many merchants throughout Australia and New Zealand distributing the Company's products. The Company is represented in England, India, the U.S.A., Singapore, and has extended its trade to Africa, Egypt, East Indies, and the Pacific Islands.

• Below : *The 30in. Rolling Mill, showing a stage in the rolling of a bloom.*





• LEFT : *Tapping a heat from an Electric Arc Furnace, the first steel making unit installed at these Works*

A BRIEF HISTORY OF THE COMPANY

As Commonwealth Steel Products Limited, the Company was formed in 1917, and commenced construction, on the present site, of a plant for the manufacture of wheels, tyres, axles, and other rail transport requirements.

When production began, the plant consisted of an electric-arc (Heroult type) steel-making furnace, a small foundry, a tyre plant, and axle shop and machine shops. Employees then numbered 140, several of whom are still in the Company's service.

Some time later, the Company became associated with the famous English firm of Vickers Limited, and in 1924 became Vickers-Commonwealth Steel Products Limited. Important extensions were made to plant and buildings, and by 1927 the number of employees rose to more than 600. Production became more diversified, embracing alloy and carbon steel castings, manganese steel castings and trackwork, dredge and mining equipment, railway couplings, ship and bridge castings, and other similar products.

The Company, by its close contacts with leading overseas makers of special steels, gained much valuable information regarding defence production, which was helpful during World War II, and also built up an organisation possessed of technical knowledge available nowhere else in Australia.

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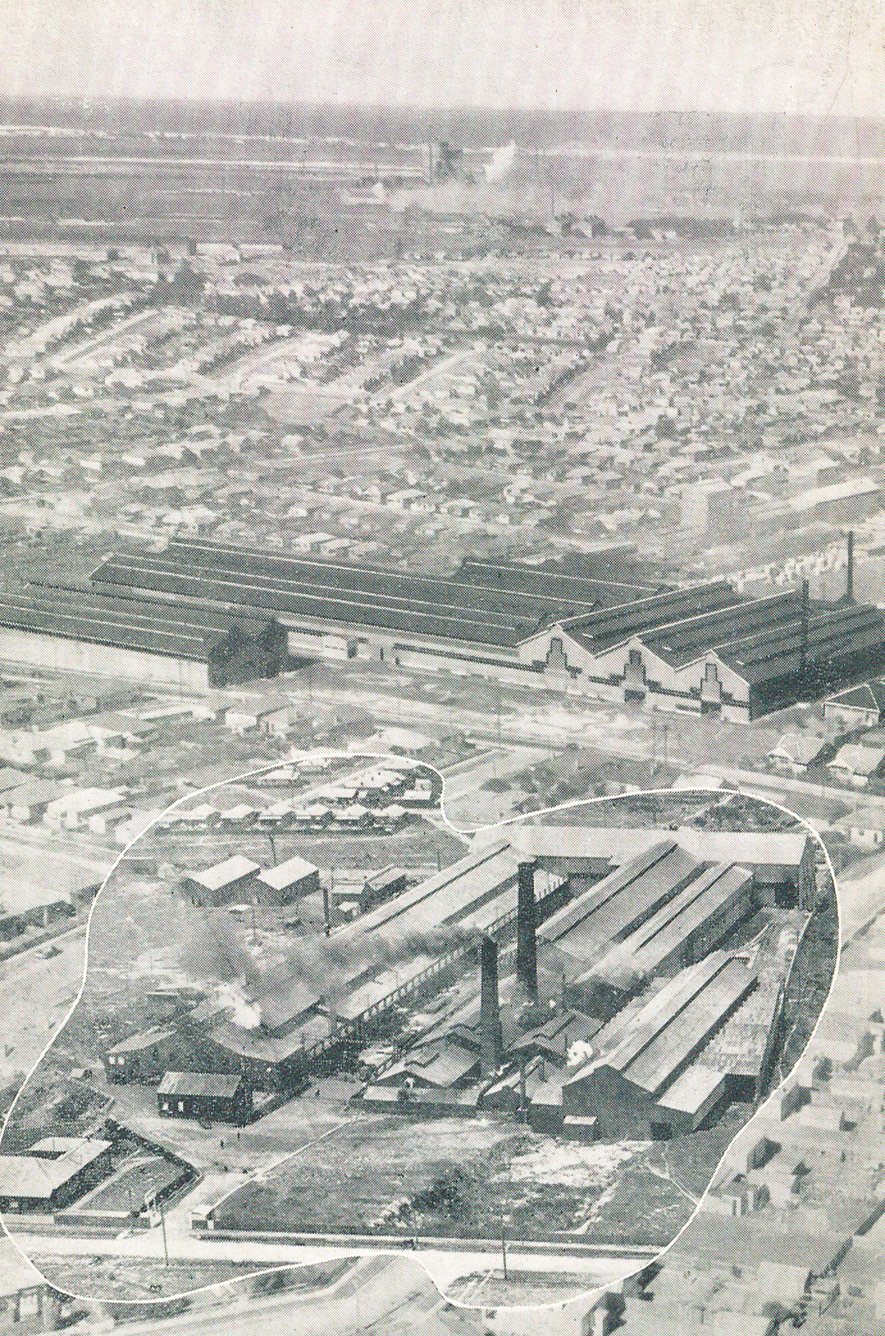
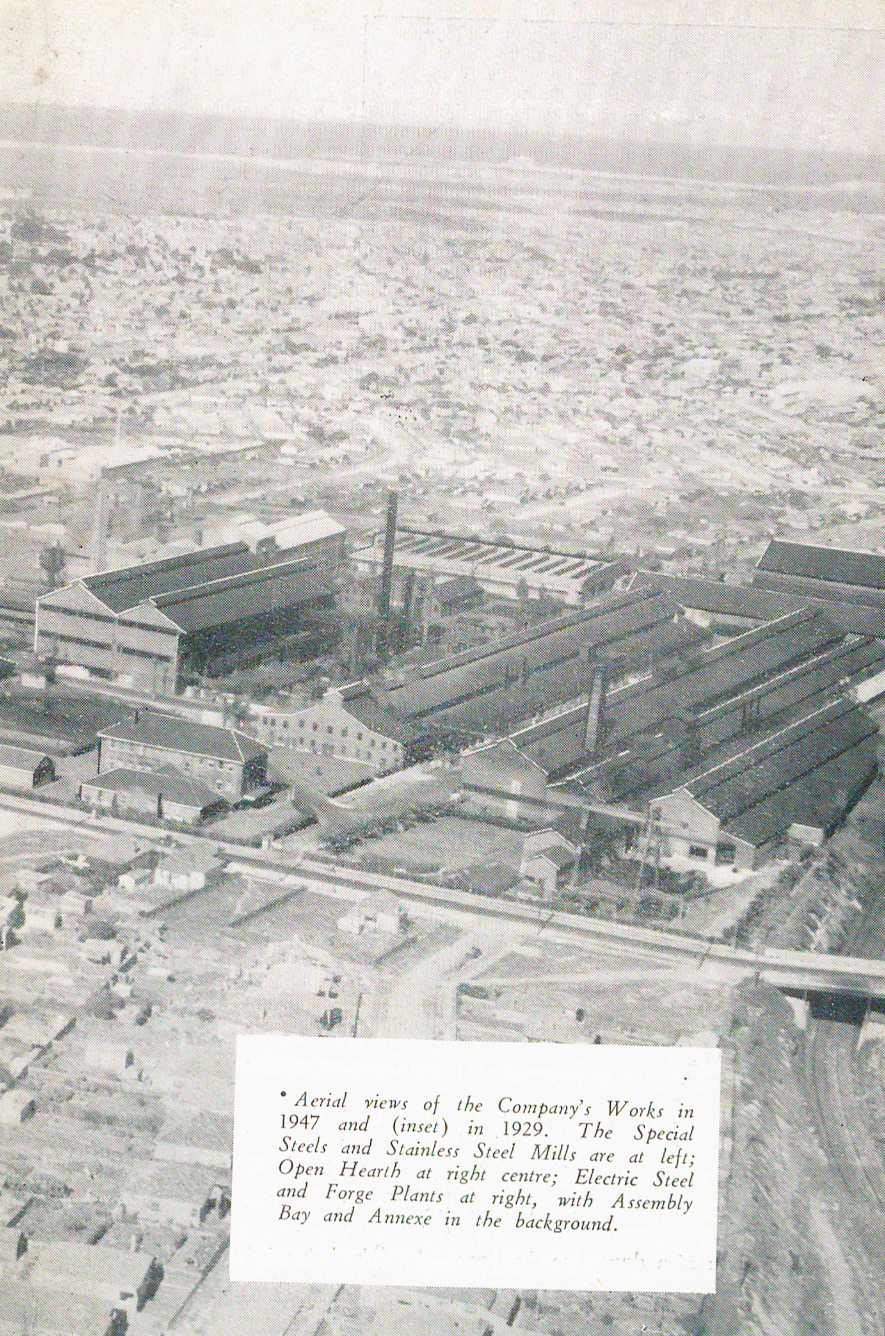
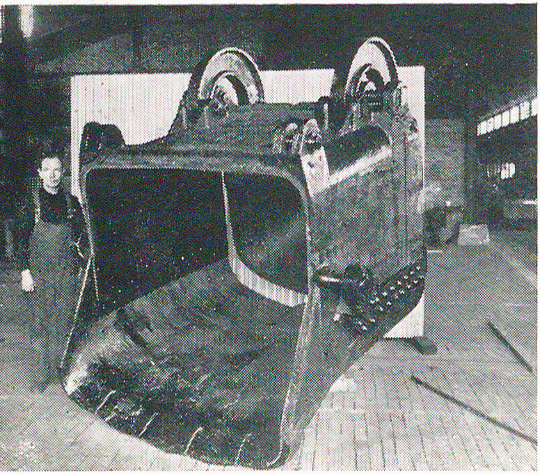




• *Aerial views of the Company's Works in 1947 and (inset) in 1929. The Special Steels and Stainless Steel Mills are at left; Open Hearth at right centre; Electric Steel and Forge Plants at right, with Assembly Bay and Annexe in the background.*



• LEFT: *One of many large power shovel buckets made at the Works. Dredge buckets, pins, skip wheels and other mining equipment are important items of production.*

In 1934, steel making capacity was increased by the construction of another electric-arc furnace. A new tyre mill, capable of rolling not only tyres but solid wheels, and weldless rings up to 15 feet diameter, was installed in 1936, with, in the meantime, the necessary extensions to other departments to cope with this increased output.

Proximity to the Newcastle Iron and Steel Works of The Broken Hill Proprietary Company Limited led eventually to a close association between the two companies, and further expansion resulted, the present title being adopted in 1935.

Much of this growth was related to planning for Empire Defence, and aimed at making Australia's steel supplies secure in the event of war. The first heat of high speed steel was produced in 1937, and plans were made for the construction of a large plant for the manufacture of special alloy and stainless steels. Plant was installed for shell production, and preparations made to produce gun-barrels and 250lb. aerial bombs. In July, 1938, the first batch of the latter was cast, and in October of the same year research and experiments in the manufacture of bullet proof plate were undertaken. In the same month, the first order for steel helmets was received.

With the growing threat of war, the tempo of expansion increased. By April, 1939, construction of the buildings for the Special Steel Plant was begun. This unit, comprising a 30in. Bloom Mill, 12in. Merchant Mill, Sheet Mill, Tool Steel Forge Plant, and ancillary equipment, was completed at high speed, and the first rolling took place on August 2nd, 1940. By February, 1941, an additional electric arc steel-making furnace of 10 tons capacity was in production, and the construction of a 50-ton Open Hearth Furnace was well advanced. This produced its first heat in January, 1942, and made large tonnages of steel for shell production Further reference to these units and their production for war will be found in the section devoted to the Company's work during 1939-45.

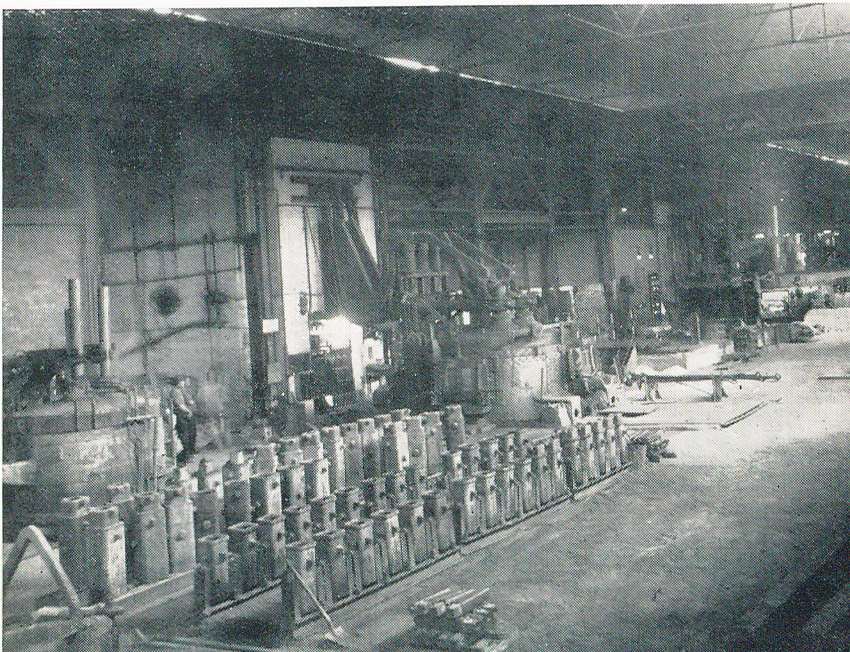
The manufacture of stainless steel, first undertaken for the production of castings, was increased following the installation of sheet and bar mills in the Special Steels Plant, and a constant programme of expansion in this field has since been pursued. Stainless and heat-resisting steel sheets and bars, formerly produced only for defence purposes, are now manufactured for a wide range of uses and are supplied to fabricators throughout Australia.

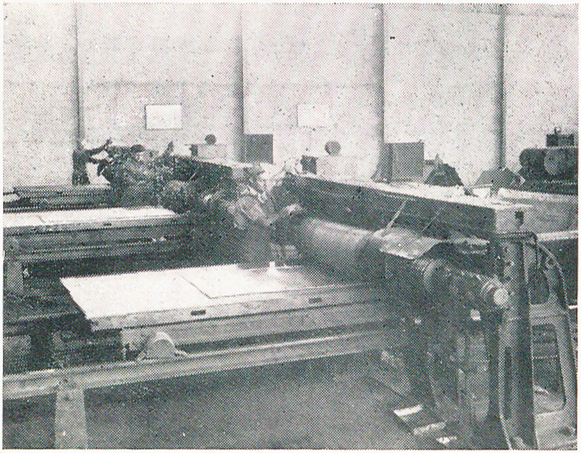
Instructions for the construction of a large shell annexe were received in August, 1939; from this unit came the first armour-piercing shells ever made in Australia.

Employment increased swiftly during the war years. Three shifts a day, seven days a week, was the rule in almost every department. A large force of new labour was absorbed and trained between 1939 and 1945, when the total number of employees reached 3600.

To-day, Commonwealth Steel Company Limited is the largest producer of special steels in Australia; it supplies a large range of castings and forgings in these steels to a wide field; and continues to provide, for export as well as for Australian railways, considerable quantities of wheels, tyres, axles, track work, and general railway castings.

• BELOW : *The Electric Steel Department, showing, from left, the three Electric Arc Furnaces. In the foreground is a row of ingot moulds for casting Tool Steel Ingots.*





• LEFT: *Three of the large battery of polishing machines employed in the finishing stages of Stainless Steel sheet manufacture.*

THE STAINLESS AND HEAT-RESISTING STEELS

One of the most important steps taken by this Company in recent years is the manufacture of the Stainless and Heat Resisting Steels, of which it is the pioneer in Australia.

Beginning with the production of stainless steel castings and forging ingots in 1935, production has rapidly increased, and these steels, in many forms, are to-day among the major items of production. They are used in scores of Australian factories for the manufacture of an increasing range of products, and their availability from an Australian source has considerably facilitated the development of many important enterprises.

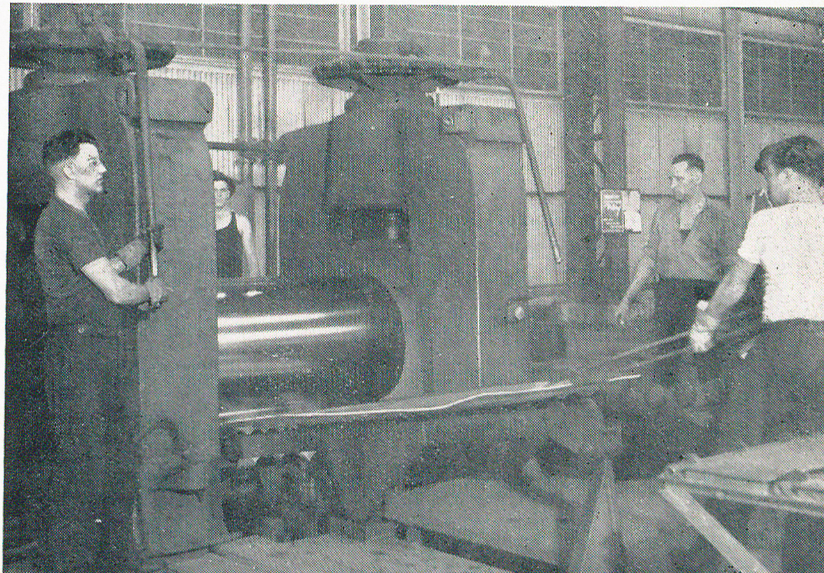
The range of grades produced was naturally limited at first, but with the construction of the Special Steels Plant and the war time demand for greater variety, this has been considerably increased. It now includes martensitic, ferritic and austenitic types, and provides for almost every commercial requirement. In addition, several special analyses, to aircraft and other specifications, were produced during the War. Stainless Steels are to-day produced which are suitable for cutlery, surgical instruments and other uses requiring good hardening properties; for pressing, spinning and drawing; and for welding or fabrication by similar means. They are supplied in grades which resist almost every corrosive condition normally encountered; as black or ground bars, or as descaled or polished sheet in a range of finishes. The heat-resisting steels are also available in bar or sheet form, in types which possess satisfactory resistance to temperatures up to 1050 degrees C. Castings and forgings in both classes of steel are also manufactured, ranging in weight from a few pounds up to 10 tons.

The entire output of these steels was, during the war, required for defence purposes. They were used in such diverse applications as food cookers and explosives factories; in aircraft engines, laboratories, hospitals and many more instances. To-day they are finding increasing usage in civil goods, such as saucepans and milk tanks — brewing vats and textile plants — cosmetic and patent medicine manufacture — in architecture, sinks and draining boards, photographic equipment, table knives and countless other products. It may be said, in fact, that wherever there is a use for metal, there is a use for one or more of the Comsteel Stainless Steels.

Their quality and performance, already proved in long service under war conditions, is based on our lengthy experience in manufacture, plus close association with the famous English firm of Firth-Vickers, upon whose practice much of our own procedure is based. We are therefore able to offer these steels with complete confidence for any recommended application.

Production begins in electric arc or induction furnaces, depending on the type and quantity of steel required. Ingots are dressed before rolling to ensure sound steel, and then pass, after rolling on the 30in. mill, to either the bar or sheet mills. After rolling, sheets are transferred to a separate warehouse for straightening, shearing to size, and polishing on a battery of specially-installed polishing machines. The whole procedure is based upon the most modern overseas practice, and yields a product equal in every way to the imported article.

• Below : *A stage in the rolling of Stainless Steel Sheets, showing the partly-rolled sheet entering the rolls.*



THE SPECIAL STEELS . . .

Planned to give Australian industries increased independence of overseas supplies, the Company's production of Special Steels proved of untold value during war and is of almost equal importance in peace.

These steels, which fall into several classifications, are essential in all engineering and in many other industries as well. They make possible the mining and working of other metals, the production of plastics and glass, and the construction of plant, machines and equipment of every kind.

The most complex of these, demanding the highest skill in manufacture, are the High Speed Steels, containing as their most important element either Cobalt or Tungsten, in proportions varying with the purpose for which the steel is intended. Possessing great hardness, even at high temperatures, these steels are used largely in lathe, planer and shaper tools, milling cutters, twist drills, reamers and so on.

Also of considerable importance are the Hot Die Steels, used in drop-forging and similar dies, and the Special Tungsten Steels, used in punches, heading and nail dies, chisels, snaps, etc.

Next comes a large group of Alloy Constructional Steels, in which nickel, chromium, molybdenum and manganese are the principal alloying elements, the proportions of these varying with the properties required. These are the steels upon which the engineer relies for the performance of his machines. They form the gears, shafts, cams and countless other components of machine tools, steam and combustion engines, automobile engines and the like. Some possess unique properties as case hardening steels; others, containing manganese, are exceptionally resistant to wear and abrasion, and are extensively used in mining, dredging and quarrying. Others again are Aircraft Steels, possessing to a high degree, both quality and dependability.

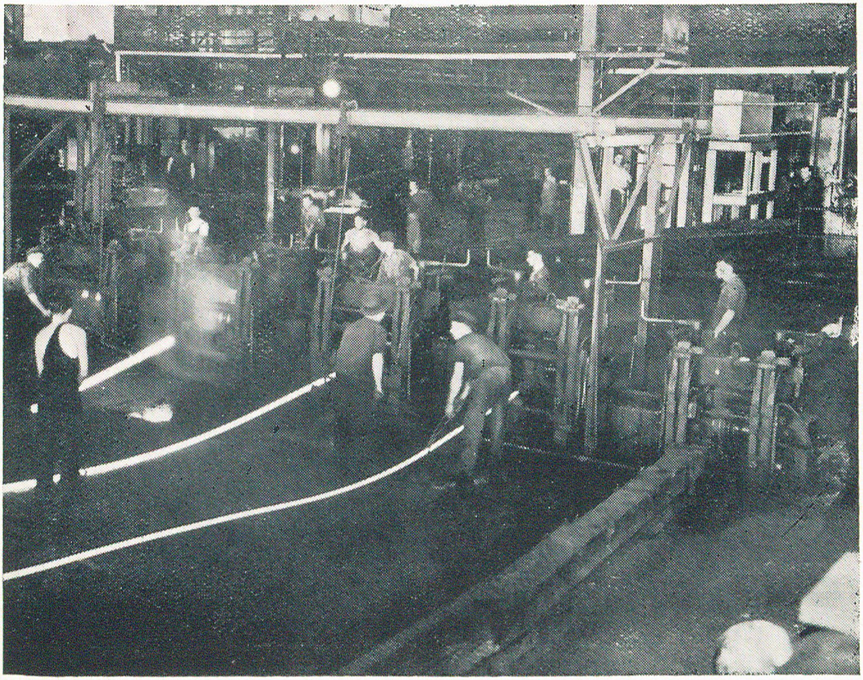
The foregoing is but a brief summary, and serves to indicate the complexity of the classification "Special Steels." It points also to the amount of skill and experience required in their successful manufacture for so wide a range of applications. This success is the result of careful planning, long experience, and close metallurgical control at every stage of manufacture.

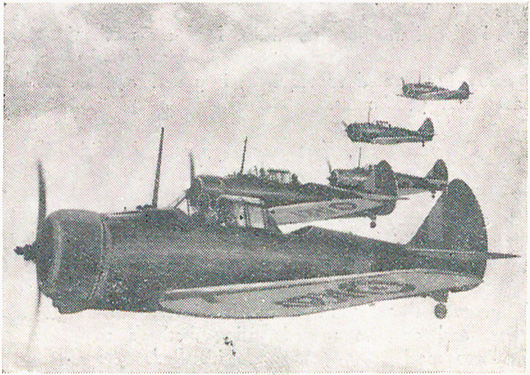
The Special Steels are made exclusively in electric arc or induction furnaces, in which close control can be maintained over alloy content, slag, temperatures and other important factors. After casting into ingots, the steel is placed in slow-cooling pits, whence it is transferred to the Special Steels Plant for rolling. In the case of many grades (and with all stainless steels) rolling is preceded by planing. High Speed Steel ingots are forged, ground and subjected to inspection under a magnetic crack detector before rolling. Rolled bars from the 12in. Mill are mechanically straightened and after being cut to length are placed in pits for slow cooling. They are subsequently heat-treated as required, inspected and branded for despatch to merchants and warehouses.

The Company's manufacture of hollow and solid drill steels for mining and quarrying is an interesting feature. These steels are called upon to withstand particularly arduous service conditions, and at the same time must be of such a composition that forging and heat-treatment may be as simple as possible. In addition, drill steel bars must possess a sound, smooth, outer surface; and the hollow bars must have a smooth, regular and concentric hole.

To secure these results, extensive investigations into Australian service conditions and overseas manufacturing methods were undertaken, and the most modern machines and methods installed. As a result, the product is equal to that of the world's leading manufacturers, and these steels are to-day widely used throughout Australia in coal mines, metalliferous mines, quarries and the like.

• BELOW : *The 12in. Mill, showing the rolling of Special Steel bars. This is a 5-strand, 3-high mill, used in rolling bars in a wide range of sections, grades and sizes.*





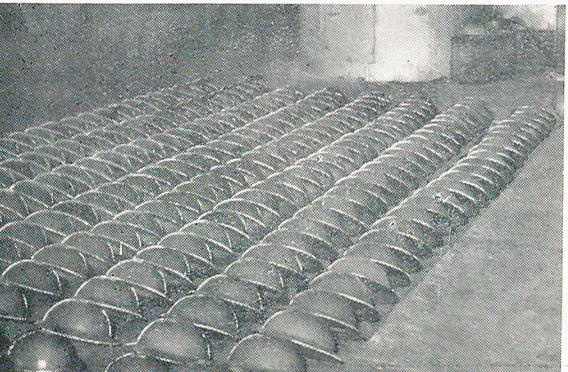
• Above : *Comsteel Aircraft Steels play an important part in the Australian production of fighters and other aircraft.*

THE WAR PERIOD

At the request of the authorities organising Empire defence, the Company had, some years before the actual outbreak of war, undertaken much experimental work and planned a considerable degree of expansion. These activities were well advanced by September, 1939, and played an important part in equipping many other industries for war production.

Following are details of some of the more important items manufactured at these works during the war :—

SHELLS: Shell production included every stage from the manufacture of the steel to assembly, after which the shells were despatched to explosives factories for filling. The steel required was naturally of a complex nature, particularly in the case of 6in. armour piercing and semi-armour piercing shells, and production at all stages was governed by high and rigid standards. Nearly 33,000 of these shells were manufactured, as well as 8000 4.7in. and 4in. naval shells, 51,000 17-pdr. nose caps,



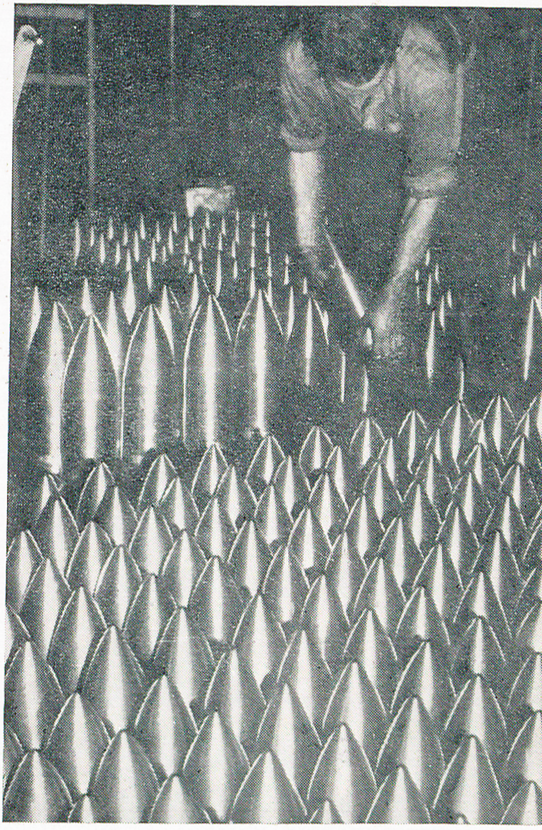
• Left : *Nearly 2,000,000 Steel Helmets were made at these Works during World War II, and supplied to Australian and other Armed Forces.*

and 79,000 4.2in. Mortar Bombs. The complexity of the planning required may be gauged from the fact that the 5in. shell required 165 manufacturing operations, 73 inspections and gaugings, and 13 operations in the heat-treatment cycle.

In addition to finished shells, large quantities of shell forgings were produced, namely, 19,000 16-pdr. and 245,000 18-pdr. forgings, for finishing by other contractors.

GUN FORGINGS: Billets and forgings for 14 different types of guns, ranging from 20 mm. aircraft cannon to 8in. naval guns were produced. These required 31,000 tons of steel ingots of various and complex analyses, and the more important quantities included 1500 3.7in. A.A., 1900 2-pdr. anti-tank, 3000 Bofors, and 4500 20-mm. cannon barrels. Over 7000 breech ring and 7000 breech block forgings for heavy guns were also manufactured.

AIRCRAFT: Pioneering the production of aircraft steels in Australia the Company produced considerable quantities for a wide range of components manufactured in Australian aircraft factories. Nearly 35,000 cylinder



• RIGHT: *Some of the thousands of shells produced at these Works during World War II.*

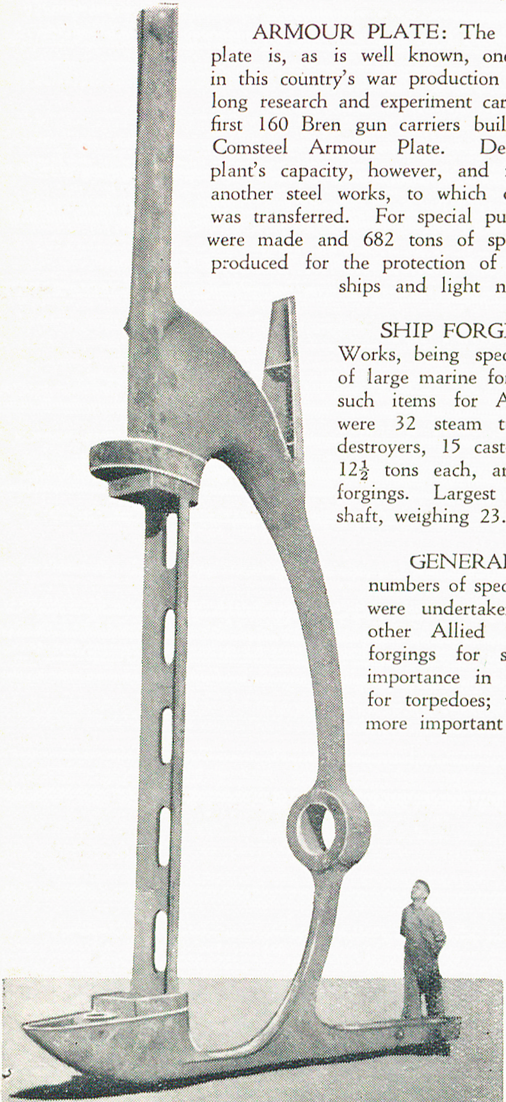
barrel forgings were also manufactured. It will be appreciated, of course, that in these and in the steel used quality was the paramount consideration, and their successful manufacture was an important achievement.

STEEL HELMETS: The first order for these, received in 1938, was for 20,000. Ultimately, nearly 2,000,000 were produced, for New Zealand and Indian as well as Australian requirements.

ARMOUR PLATE: The Australian manufacture of armour-plate is, as is well known, one of the outstanding achievements in this country's war production programme. It was the result of long research and experiment carried out by this Company and the first 160 Bren gun carriers built in Australia were equipped with Comsteel Armour Plate. Demand subsequently exceeded the plant's capacity, however, and mass production was achieved at another steel works, to which our store of technical information was transferred. For special purposes, 731 tons of heavy armour were made and 682 tons of special manganese non-magnetic plate produced for the protection of the vulnerable parts of merchant ships and light naval vessels.

SHIP FORGINGS AND CASTINGS: These Works, being specially equipped for the production of large marine forgings and castings, provided many such items for Australian shipyards. Outstanding were 32 steam turbine castings for Tribal Class destroyers, 15 cast-steel stern frames weighing up to $12\frac{1}{2}$ tons each, and many crankshaft and tailshaft forgings. Largest of the latter was a 75 feet long shaft, weighing 23.35 tons, for an Australian cruiser.

GENERAL: As well as the foregoing, large numbers of special jobs too numerous to detail here were undertaken for the Australian, U.S. and other Allied Forces. These included hollow forgings for special chemical plant of great importance in explosives production; air vessels for torpedoes; turret rings for tanks, and many more important items.



• LEFT: *A large cast steel stern frame for a merchant vessel. Production of these to-day plays an important part in peace-time ship-building.*

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